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Helminth Parasites of the Bald Eagle, *Haliaeetus leucocephalus,* in Florida

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ABSTRACT: Twenty species of helminths (9 trematodes, 9 nematodes, and 2 acanthocephalans), including 9 new host records, were collected from 40 bald eagles (*Haliaeetus leucocephalus*) from Florida. Intensities of infection were low and no lesions were attributed to the parasites. No species were considered specialists in bald eagles; 5 species were considered raptor generalists and the remainder, generalists in other orders of fish-eating birds. An undescribed species of *Hamatospiculum* was found in 3 birds. Most of the common helminths were acquired from eating fish intermediate hosts.

KEY WORDS: Helminths, bald eagle, parasites, *Haliaeetus leucocephalus, Hamatospiculum.*

The American bald eagle, *Haliaeetus leucocephalus* (L.), after a dramatic decline in the 1950's and 1960's due to pesticide contamination and illegal hunting, has made a remarkable recovery, and in 1995 was removed from the Endangered Species List and reclassified as a threatened species (Federal Register, 1995). Nesbitt (1996) estimated the population of bald eagles in Florida to be between 2,330 and 3,443 and pronounced it "healthy." Adults in southern Florida are permanent residents, but some adults from populations in north-central Florida and the panhandle migrate northward (Robertson and Woolfenden, 1992).

Because of its protection under the Bald Eagle Act of 1940, information on the helminth parasites of *H. leucocephalus* is limited. Kocan and Locke (1974) published a list of 10 species of helminths, and Tuggle and Schmeling (1982) gave data on 13 species found in bald eagles from the United States, including some from Florida, but included no data on prevalence or intensity. Richardson and Cole (1997) recorded 5 species of acanthocephala from bald eagles from the United States including Florida. In this report, we combine records of helminths collected from bald eagles from Florida at the Department of Pathobiology, University of Florida (UF), Gainesville, and the National Wildlife Health Center (NWHC), Madison, Wisconsin.

Twenty-one injured or dead bald eagles submitted to the Department of Pathobiology (UF) between December 1992 and April 1995 were examined at necropsy according to the methods of Kinsella and Forrester (1972). Nineteen bald eagles submitted to the NWHC between January 1986 and December 1994 were examined for cause of death and helminths were collected when found, but parasite examinations were incomplete and not quantitative. Voucher specimens of helminths were deposited in the Harold W. Manter Laboratory, University of Nebraska State Museum, Lincoln.

Helminths representing 20 species (9 trematodes, 9 nematodes, and 2 acanthocephalans) were collected from the 40 bald eagles. Nine new host records were found. Prevalences and intensities of helminths from the 21 completely necropsied birds are listed in Table 1. Intensities of infection were low and no significant lesions were associated with any of the infections. Table 2 gives helminth prevalences for the 19 birds from the NWHC. Intensities are not listed since only samples of the helminths were collected for identification. Again, helminth infections were not implicated as the cause of significant lesions or death in these hosts.

Gravid worms were present for all species except for *Gnathostoma* sp. *Physaloptera* sp., and *Centrorhynchus kuntzi,* indicating that the bald eagle is a "competent" definitive host for most of the species found. Richardson and Cole (1997) recently reviewed all acanthocephalan records from bald eagles in North America, but reported no *C. kuntzi.* Two birds were infected in the present study with an adult male and an adult female, but the female contained no eggs.

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Table 1. Prevalences and intensities of helminths of 21 Florida bald eagles examined at the University of Florida.

	HWML acc. no.	Location in host*	Prevalence		Intensity	
			No. inf.	%	Mean	Range
Trematoda						
Renicola thapari Caballero, 1953†	39099	K	6	29	18	1–82
Mesostephanus appendiculatoides Price, 1934†	39098	SI	6	29	36	1–85
Phagicola longa Ransom, 1920	39094	SI	6	29	291	10–1,245
Phagicola sp.†	39097	SI	1	5	25	25
Microparyphium facetum Dietz, 1909†	39093	C	5	24	2	1–3
Strigea falconis Szidat, 1929	39100	SI	3	14	2	1–2
Neodiplostomum attenuatum (von Linstow, 1906)	39095	SI	3	14	5	3–9
Posthodiplostomum minimum (MacCallum, 1921)†	39096	SI	1	5	1	1
Nematoda						
Contracaecum spp.‡	—	E, V	9	43	10	1–76
Capillaria falconis (Goeze, 1782)	39110	SI	8	38	3	1–14
Eucoleus contortus (Creplin, 1839)	39109	E	8	38	6	1–18
Desportesius invaginatus (von Linstow, 1901)†	39113	E	2	10	12	11–13
Chandleronema longigutturata (Chandler, 1942)†	39112	V	1	5	5	5
Gnathostoma sp. (immature)	39108	SI	1	5	1	1
Physaloptera sp. (immature)	—	V	1	5	3	3
Immature spirurids	—	E, V	5	24	25	1–118
Acanthocephala						
Centrorhynchus kuntzi Schmidt and Neiland, 1966†	39338	SI	2	10	1	1
Polymorphus brevis (Van Cleave, 1916) (=*Arythmorhynchus brevis*)	39101	SI	5	24	4	1–10

* Location in host: C = cloaca, E = esophagus, K = kidney, SI = small intestine, V = ventriculus.

† New host record for bald eagle.

‡ A complex of 2 species, *Contracaecum rudolphii* Hartwich, 1964 (HWML No. 39111), and *C. multipapillatum* (Von Drasche, 1882) (HWML No. 39342), combined because the immature stages could not be distinguished.

Kocan and Locke (1974) reported *Centrorhynchus* sp. from bald eagles in 4 states, but their specimens are not available for examination, so the status of the eagle as a competent host for *C. kuntzi* still remains to be determined.

A species of *Hamatospiculum* found in 3 birds appears to be the same undescribed species found recently in 2 Cooper's hawks, *Accipiter cooperi,* in Nebraska (Sterner and Kinsella, unpubl.). The specimens reported as *Serratospiculum amaculata* by Tuggle and Schmeling (1982) U.S. (National Parasite Collection No. 77004) were reexamined and determined to be the same *Hamatospiculum.* This casts into doubt the record of *S. amaculata* from the bald eagle by Kocan and Locke (1974), but those specimens were not available for examination. The description of the new species is in process.

The helminths listed in Tables 1 and 2 differ substantially from the list of Tuggle and Schmeling (1982), who examined 84 bald eagles from 18 states, including Florida. Tuggle and Schmeling collected parasites by sight and no fine-mesh screening was done, so only large specimens

Table 2. Records of helminths from 19 Florida bald eagles examined at the National Wildlife Health Center, Madison, Wisconsin.

	HWML acc. no.	Location in host*	Prevalence	
			No. inf.	%
Trematoda				
Strigea sp.	—	SI	3	16
Neodiplostomum attenuatum (von Linstow, 1906)	—	SI	1	5
Phagicola nana Ransom, 1920†	39337	SI	2	11
Phagicola sp.	—	SI	4	21
Mesostephanus appendiculatoides (Price, 1934)	—	SI	2	11
Microparyphium facetum (Dietz, 1909)	—	C	1	5
Renicola sp.	—	K	1	5
Nematoda				
Contracaecum spp.‡	—	E, V	8	42
Eucoleus contortus (Creplin, 1839)	—	E	1	5
Hamatospiculum sp.†	39341	A	3	16

* Location in host: A = air sacs, C = cloaca, E = esophagus, K = kidney, SI = small intestine, V = ventriculus.

† New host record for bald eagle.

‡ A complex of 2 species, *Contracaecum rudolphii* Hartwich, 1964, and *C. multipapillatum* (von Drasche, 1882), combined because the immature stages could not be distinguished.

such as *Clinostomum* and *Contracaecum* were commonly collected. The present study is more representative of the overall helminth fauna of bald eagles.

In recent studies of helminths of hawks and falcons (Kinsella et al., 1995) and ospreys (Kinsella et al., 1996), 3 groups have been recognized; specialist, with the bulk of the population in a single host species; raptor generalist, found only in hawks and owls; and bird generalist, found in several orders of birds. None of the species found in this study can be considered specialists in bald eagles, and only 5 (*Strigea falconis, Neodiplostomum attenuatum, Capillaria falconis, C. kuntzi,* and possibly *Hamatospiculum* sp.) can be considered raptor generalists. The remaining species are found in a variety of fish-eating birds such as herons, spoonbills, and pelicans (e.g., *Phagicola* spp., *Mesostephanus appendiculatoides, Microparyphium facetum, Renicola thapari, Contracacecum* spp.). In contrast, the osprey, which commonly shares habitats with bald eagles, had 7 specialist species, none of which were found in the eagle. The osprey did share 1 raptor generalist (*C. falconis*) and several bird generalists (*Contracaecum* spp., *Phagicola* spp., *M. facetum*) with the eagle.

The diet of the bald eagle varies extensively both with geographic location and time of the year (Gerrard and Bortolotti, 1988). In north-central Florida, 75% of the prey items found in or near eagle nests were fish, with coots and small mammals making up most of the remaining items (McEwan and Hirth, 1980). Nine of 20 species found in this study (e.g., *Contracaecum* spp., *Phagicola* spp., *P. brevis*) are known to have fish intermediate hosts (Huizinga, 1966; Deardorff and Overstreet, 1980; Font et al., 1984). In some cases, the helminths could act as biological tags, indicating whether the eagles had been feeding in freshwater or marine environments (e.g., *Phagicola longa* in mullets—*Mugil* spp., and *Phagicola nana* in centrarchids—*Lepomis* and *Micropterus* spp.).

No tapeworms were found here in eagles, although Kocan and Locke (1974) reported *Cladotaenia banghami* from bald eagles in 5 states, including Florida. The paucity of mammals in the diet of Florida eagles may explain the rarity of *Cladotaenia* spp., which use mammals as intermediate hosts.

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